



APPLIED FORESTRY NOTES

NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

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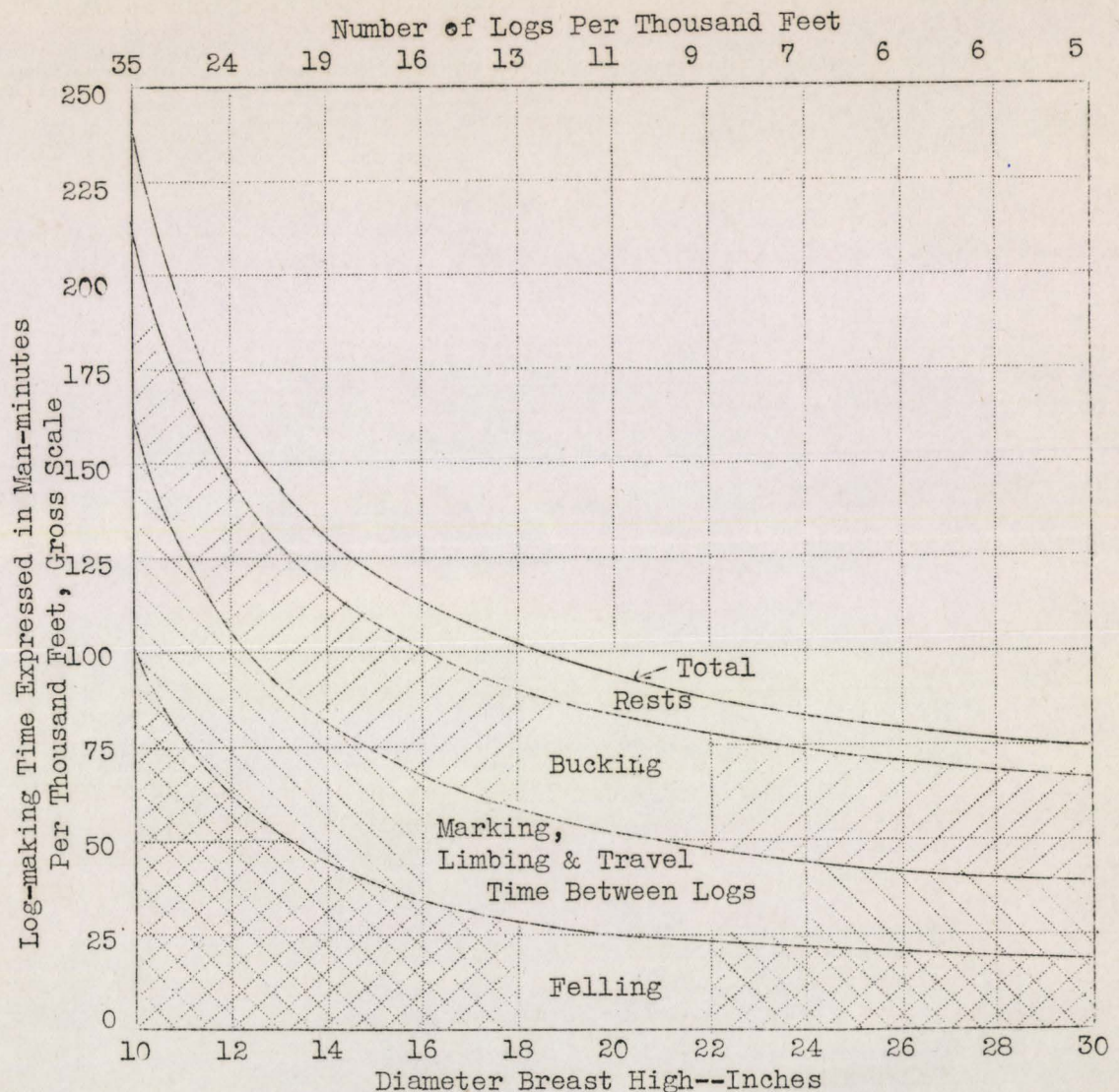
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Relation of Tree Size in Western White Pine to Log-Making Costs

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This digest of log-making costs is part of a major study by the Station of the economics of timber exploitation in western white pine forests. Companion studies now under way deal with size-to-cost relationships in skidding, loading, hauling, and other tasks in a logging operation. Studies in the sawmill will show the cost of manufacture for trees and logs of different sizes and qualities and also the amount, grade, and value of lumber cut from them. With such information at hand, it will be possible to ascertain better than ever before the stumpage conversion value of a tree standing in the woods and to show by scientific appraisal what trees or logs it is economically sound to utilize, which are handled at a loss, and whether any changes should be made in conventional cutting practices.

Experienced sawyers know in a general sort of way, that it takes them longer to manufacture a thousand feet of logs from small timber and that when they work in large timber output increases. Size of timber influences their output more than any other factor. The curves on the next page indicate this. They show that when trees 10 inches in diameter breast high are made into logs, it takes 236 man-minutes for every thousand feet of timber felled, whereas for 25-inch trees, only 81 man-minutes are needed. Thus the cost is three times as much in one case as in the other.



RELATION OF TREE DIAMETER TO LOG-MAKING COSTS

The above curves are based on time studies made near Orofino, Clearwater County, Idaho, in a stand of western white pine timber, 141 years of age. Felling data were obtained for 279 trees and bucking data for 1,648 cuts. Timber was felled in autumn of 1935 on slopes ranging from 0 to 40 percent. Brush and windfalls were of light to medium density. Timber volumes are based on the Scribner decimal C log rule. The basis of volume or gross scale, is the portion of the tree included between stump height and end of the last utilized log; included are merchantable logs, breakage, long-butts, and defects within utilized logs. To place costs on a net log scale basis, allowance must be made for cull and breakage.

Numerous applications can be made of the size-to-cost relationships shown by the curves. They can be used to compute the cost of log-making for a given logging chance if the volume of timber by size classes is known. Or rates of pay (piece work basis) can be calculated which will be fair to both employer and employee when sawyers work in different sizes of timber. Or estimates might be made of the profit or loss in handling different sizes and types of trees so that uneconomic practices and policies might be avoided.

In order to apply the cost-to-size relationships of the figure to a given area, it is necessary to know the average size of timber on the area. Then an answer can be obtained to certain practical problems of which the following are examples:

An operator wishes to know how much he should pay his sawyers per thousand feet for log-making. He wants them to earn an average of 60 cents per hour. The pay will be based on the net scale of logs; cull of all kinds will average 15 percent including breakage, long-butts, and internal defect. The timber averages 20 inches in diameter breast high or 11 logs per thousand feet.

Solution: Referring to the figure, the time needed for sawing a thousand feet, gross scale, from 20-inch trees is 93 man-minutes or in terms of net scale (defect 15 percent), it amounts to 93 increased by 15 percent, or 107 man-minutes. Since the average earnings of sawyers are to be 60 cents per hour, the value of one man-minute becomes 1 cent and the rate of pay should be \$1.07 per thousand feet, net scale.

Likewise, log-making costs for small second-growth white pine averaging 20 logs per thousand feet can be computed. Referring to the figure, 20-log timber will require 137 man-minutes per thousand feet, gross scale. Assuming normal cull is 5 percent and the value of one man-minute is 1 cent, the cost on a net scale basis should be \$1.44 per thousand feet.